REMARKS

As indicated above, the enclosed Request for Continued Examination is filed in order to provide claims which applicant believes more clearly set forth the metes and bounds of the invention. The proposed claims are in accordance with the original restriction requirement wherein claims directed to a proton conductor or a proton-conducting membrane – *i.e.*, an electrolyte that would be useful in fuel cells – were elected. No new matter has been added in the context of the proposed claims which are fully supported by the specification.

Claim 75 is directed to the component of the invention where a metal or metal hydride support is coated on one or both faces with an EIPC coating with a specified low range of resistance for protons at the desired temperatures. Support for the general features of the component are found, for example, on page 26, line 9 and the accompanying explanation of C/D/C for example, on page 28, lines 3-7. The nature of D is further elucidated on page 27, lines 17-18 and in former claim 32, and of the EIPC coating(s) represented by C on page 28, lines 12-13. Support for this range of resistance is found on page 17, at lines 3-4. Support for the temperature range is found at that location as well. Support for "non-liquid" is found, for example, on page 11, lines 3 and 8.

Support for the metals or metal hydrides specified in claim 77 is found on page 23, line 10 and on page 27, line 19. Claim 76 simply lists the metals that are components of these specified embodiments.

Support for claim 78 is found on page 28, beginning at line 15 and continuing to page 29, line 16.

Support for claim 79 is found on page 29, lines 13-16. Support for the limitations of claims 80 and 81 is found on pages 27-28, bridging sentence.

Claim 82 is supported in Figure 4 and its description on page 12, at lines 16-17. Claim 83 relates to a method to prepare the component of claim 75.

Claims 84-92 are an alternative formulation of claims 75-79, where the properties of the coating are described in terms of conductivity for protons as a function of temperature in the gap shown in Figure 1. Support for this characterization is found on page 10, for example, lines 12-13 and on page 11, lines 9-13. Claims dependent on claim 75 track claims 76-79.

Accordingly, the proposed claims are fully supported by the specification.

The Invention

The nature of the invention as now claimed is perhaps most succinctly described on page 1, lines 12-19.

In more detail, as stated in the specification, it is desirable to provide electrolytes in fuel cells that will permit operation of these cells at temperatures where poisoning by CO is not an issue and oxygen reduction kinetics are greatly improved (pages 6-7, bridging paragraph). The invention seeks to provide materials suitable for fuel cells that will operate at a favorable temperature range – *i.e.*, between 175°C and 550°C.

The electrolyte in a fuel cell must have high proton conductivity at the desired temperature but be electronically insulating. In order to provide satisfactory proton conductivity in this temperature range, non-liquid-containing electrolytes such as those described by Norby must be supplied as unacceptably thin films – *i.e.*, films that cannot maintain their integrity without support. The present invention solves this problem by coating the electronically-insulating proton-conducting (EIPC) material as a film on a metal or metal hydride support (generally, the EIPC is coated onto the metal which becomes a hydride during operation). The supporting metal or metal

hydride support is a satisfactory proton conductor. It is electronically conducting, but that is irrelevant in view of the insulation provided by the EIPC. Thus, providing the EIPC as a coating on a solid metal or metal hydride support with satisfactory properties solves the problem of supplying the EIPC at a sufficient thinness to exhibit the desired combination of proton conductivity and electronic insulation while maintaining sufficient integrity to be of practical use.

Applicant believes that no document of record, or of which he is aware, suggests this configuration for a component used as an electrolyte in a fuel cell. It is thus believed that the claims as presently proposed are clearly distinguishable from the art. There is no suggestion in the art to provide a thin EIPC with suitable properties at the desired temperature range which needs to be and is supported by a metal or metal hydride so as to provide sufficient strength for practical use in a fuel cell.

Response to Rejection

It is believed that the majority of the rejections set forth in the final Office Action to which this is a response are addressed by the proposed claims. However, in order to ensure complete responsiveness, applicant comments on these rejections, briefly, as follows:

Formal Matters

The proposed claims are directed to the originally elected invention; the objection to maintenance of non-elected claims is believed mooted by the proposed claim set.

Applicant appreciates the consideration of the IDS submitted on 10 October 2003.

Rejections Under 35 U.S.C. § 102

All claims now require an electronically-insulating proton conductor (EIPC) which is coated on one or both faces of a metal or metal hydride support. Of the examined claims (claims 1, 3, 31-33, 44, 46 and 69-73), only claims 32-33 contain this requirement. Claims 32 and 33 were free of all rejections except that over Norby as set forth on pages 5-6 of the Office action.

Norby: The statements with regard to claims 1, 3, 44 and 46 are not applicable because the issue of the open structure of the layer itself forming the conducting support is mooted by the requirement for the metal or metal hydride support. Dependent claims 31, 69 and 72, and 70 and 73, also lacking the requirement for metal or metal hydride support, were considered disclosed by Norby as well. Applicant believes that he need only address that portion of the rejection which applies to claims 32-33 since the aforesaid limitation of claim 32 now is present in all claims.

Norby is said to disclose in section 5.1 that a metal hydride can be used with a solid polymer electrolyte in fuel cells. Respectfully, it is believed that the description in this section does not describe the use of a metal hydride as a support for an electrolyte. Rather, as set forth on page 7, left-column, last paragraph, it is said that one can buy a complete small scale "hydrogen power unit" wherein, in that unit, there is exhibited "gas storage at atmospheric pressure or in a metal hydride" *and* a fuel cell. Thus, the metal hydride is not included in the fuel cell, but rather in a "hydrogen power unit" which includes the metal hydride as a gas storage mechanism. This is an entirely different use for a metal hydride from that set forth in the claims.

The Office action goes on to state that "palladium is an established material in hydrogen-permeable membranes" citing section 5.2 of Norby. Again, it is believed that the disclosure of Norby falls short. The discussion in section 5.2 referred to by the Office is apparently in

paragraph 5.2.1 which states "palladium is an established material in hydrogen-permeable membranes, but has some limitations." Over and above the point that this does not describe coating palladium with an EIPC with certain required characteristics, it is believed this statement is taken out of context. The paragraph in question is discussing hydrogen separation membranes. Specifically, it states that the membranes – *i.e.*, palladium, may be used in hydrogen purification systems. Thus, Norby does not describe or suggest palladium or metals as supports for coatings of EIPC, but rather as a hydrogen purification tool. This is an entirely different context from that set forth in the present claims.

Hsu: It is further noted that claims 32 and 33 are not rejected for anticipation on any other basis. Since the present claims contain the limitations of claim 32, the pending claims are free of the rejection over Hsu, which was applied only to claims 1, 3, 44 and 46.

The Rejections Under 35 U.S.C. § 103

Claims 31, 71 and 74 were rejected over Hsu in further view of Crome; over Norby in further view of Kwang Hyun Ryu and over Norby in combination with Dorthe Libye. Claim 32 is not included in any of these rejections and thus these rejections are not applicable to the present claims.

Request for Comments

Applicant has attempted to claim his invention specifically, completely, and succinctly. Applicant is aware that nuances in claim wording often give rise to objections. Should the Examiner believe that the claim wording could be improved or altered in some minor way to expedite prosecution, a telephone call to the undersigned is respectfully requested.

CONCLUSION

The claims have been amended to more clearly state the invention. All of the present claims contain the limitation of claim 32 which was subject only to a rejection for anticipation over Norby. As has been shown above, the disclosure of hydrides by Norby is as a gas storage device and the disclosure of palladium is as a hydrogen purification membrane. Norby does not disclose or suggest the use of metal or metal hydride as a support for an EIPC. Accordingly, it is believed that the present claims are free of the cited art and passage of these claims to issue is respectfully requested.

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorize the Assistant Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket No. 491712000100.

Respectfully submitted,

Dated: July 23, 2004 By: Kate H. Murashige

Kate H. Murashige
Registration No. 29,959

Morrison & Foerster LLP
3811 Valley Centre Drive,
Suite 500
San Diego, California 92130-2332
Telephone: (858) 720-5112
Facsimile: (858) 720-5125